Associations between Social Function and the Perception of Odor Stimuli

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BACKGROUND

- Sensory defects are widely noted in Autism Spectrum Disorder (ASD) (Bennetto et al, 2007). there is sufficient evidence to support olfactory impairments in ASD, it is the least investigated area of sensory defect in ASD (Hilton et al., 2010).
- The DSM-5 criteria for ASD includes persistent deficits in social communication and social interaction across contexts which includes deficits in social-emotional reciprocity, deficits in nonverbal communicative behaviors used for social interaction and deficits in developing and maintaining relationships (American Psychiatric Association, 2013).
- Impaired odor identification is a strong predictor for social impairment in individuals with ASD and suggest a possible relationship between social motivation and olfactory perceptions (Seo, Lee & Cho, 2013). However, less research has been conducted on the relationship between social function, social motivation, and the perception of odor stimuli in normative populations.
- The processing of olfactory stimuli and social learning heavily rely on structures within the limbic system (Sullicvan et al., 2015). This suggests that social function is heavily influenced by ones sense of smell and may explain why olfactory impairments are strong predictors for socail dysfunction (Sullivan et al., 2015).
- Social function in individuals with ASD differs based on sex (Mortin, 2018). Females are more likely to have higher social motivation and navigation skills (Mortin, 2018). However, there is limited research in sex differences in ASD because a majority of the research has been conducted on the male population.

SPECIFIC AIMS

The main aim of this study is to examine how the perception of odor stimuli influences social functioning.

***Aim 1*:** Investigate associations between olfaction threshold and smell identification, and social motivation, social pleasure and social navigation.

Aim 2: Investigate the ability for odor identification to predict social dysfunction in a normative population of undergraduate students.

Aim 3: Examine sex differences in olfactory function tasks.

Aim 4: Examine sex differences in social function tasks.

METHODS

Sample

- 27 undergraduate students from the University of Dayton participated in this study for research credit. The total expected amount of participants for this study is 200 undergraduate students.

Olfaction Measures:

- *Importance of Olfaction* (Croy et al., 2009): 20-item self report measure of olfactory sensations, application of the sense of smell, and the readiness to draw consequences from the olfactory perception.
- *Sniffin' Sticks Threshold Test* (Burghart Instruments, Wedel, Germany): Used to assess odor detection acuity. The test utilizes pen-like odor dispensing devices, 32 blanks (no odor) and 16 containing varying concentrations of n-butanol (alcohol).
- *Sniffin' Sticks Identification Test* (Burghart Instruments, Wedel, Germany): Used to assess smell identification. The test utilizes 16 pen-like devices to deliver common odorants (e.g. orange, peppermint, rose) with a 4 forced-multiple choice response format **(Figure 1)**.
- *Olfactory Hedonics*: Ratings of odor pleasantness and unpleasantness were assessed following the administration of each Sniffin' Sticks Identification odorant using two five-point ordinal scales with visual aids **(Figure 1)**.

Social Function Measures:

- *Iowa Gambling Task (Buelow & Suhr, 2009)*: Computerized card task which assesses real-life decision making. The task includes four decks of cards that either result in an advantageous or disadvantageous outcome.
- *Reading the Mind in the Eyes Test* (Oakley et al.,2016): Test: 28 images of human eyes depicting different emotional states were displayed. Theory of the mind was assessed based on participants choice between four fixed options of mental state terms.
- *Anticipatory and Consummatory Interpersonal Pleasure Scale (ACIPS;* Gooding & Pflum, 2014): 17-item self report measure that assesses the degree to which one looks forward to social interactions and the degree to which they experience pleasure from social and interpersonal interactions as they occur.
- *The Motivation and Pleasure Scale (MAP-SR;* Llerena et al., 2013): 18-item self report measure that assesses social motivation and pleasure. Each item is rated on a 5-point Likert scale. Six of the items target socail, recreational, and work pleasure, 6 items target feelings and motivations around family romantic partners, and friends, and 6 of the items target the motivation and effort to engage in activities or events.

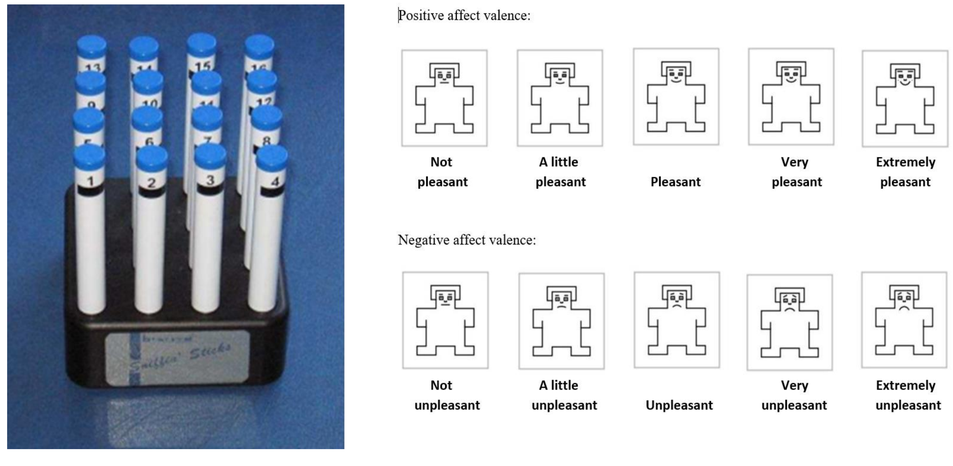

Figure 1. Sniffin' Sticks Identification Test **(left)** and Olfactory Hedonics Rating Scales **(right)**

ANTICIPATED RESULTS

***Hypothesis 1*:** Scores from the *Anticipatory and Consummatory Interpersonal Scale (ACIPS), Social Anhedonia Scale, and Motivation, Social Pleasure Scale (MAP-SR), Iowa Gambling Task, and Reading the Mind in Eyes Test* will be positively correlated with scores from the Importance of Olfaction Scale.

Hypothesis 2: Odor Identification scores will be positively correlated with social function as assessed by the *Anticipatory and Consummatory Interpersonal Pleasure Scale (ACIPS), Social Anhedonia Scale, Social Pleasure Scale (MAP-SR), Iowa Gambling Task, and Reading the Mind in Eyes Test.*

Hypothesis 3: Females will outperform their male counterparts on olfaction threshold and odor identification tasks and score higher on the Importance of Olfaction Scale.

Hypothesis 4: Female will outperform their male counterparts on social function tasks*: Anticipatory and Consummatory Interpersonal Scale (ACIPS), Social Anhedonia Scale, Motivation and Social Pleasure Scale (MAP-SR), Iowa Gambling Task, and Reading the Mind in Eyes Test.*

SIGNIFICANCE

- Social dysfunction is present in a number of psychiatric disorders such as Autism Spectrum Disorder, Schizophrenia, Depression and Anxiety.
- Given that odor identification shows a strong relationship to social function, further understanding of the relationship could lead to olfaction being used as a predictor or marker for specific psychiatric disorders.
- There are few studies that examine sex differences in social function within both ASD and normative populations. Further understanding of sex differences in social function could influence the way ASD is diagnosed.

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